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UNITED STATES DEPARTMENT OF AGRICULTURE

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A. D. MELVIN, Chief

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MILK AND CREAM CONTESTS.

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INTRODUCTION.

Among those engaged in the production of sanitary milk there is an axiom that "education accomplishes more than legislation." To a certain point law can be applied; glaringly insanitary conditions and willful wrongdoing can be severely dealt with, but after a certain degree of cleanliness has been reached much of the subsequent improvement must be based upon the incentive offered the producers to go to more trouble and expense to improve the product.

For the purpose of teaching producers the fundamentals of clean-milk production, as well as offering them an incentive, the plan of holding milk and cream contests was devised. On February 14–24, 1906, during the National Dairy Show in Chicago, Ill., the first milk and cream contest was held. A tentative score card was devised for rating the samples, and from time to time, as defects were demonstrated, this card has been modified. From the beginning rapid progress has been made and in the nine years from February, 1906, to February, 1915, 87 such contests have been judged by members of the Dairy Division, Bureau of Animal Industry, United States Department of Agriculture.

In March, 1907, with the belief that these contests would aid greatly in improving the milk supply of a city, the first city milk

NOTE.—This bulletin is of interest to dairymen generally, and especially to those who are engaged in improving the output of their establishments.

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contest was held in Cleveland, Ohio. The Dairy Division, by supplying judges and lecturers, cooperated with the chamber of commerce of that city. Since the Cleveland exhibit several other cities have seen the value of these contests and have conducted similar enterprises. Usually the chamber of commerce arranges for the exhibit by securing a meeting place, furnishing the prizes, and sending advertising matter to the dairymen and consumers. Among the cities that have held such contests are Cleveland, Columbus, Toledo, Cincinnati, and Dayton, Ohio; Pittsburgh and Philadelphia, Pa.; Detroit, Muskegon, Grand Rapids, and Pontiac, Mich.; Jacksonville and Tampa, Fla.; South Bend, Ind.; Cumberland, Md., and Rochester, N. Y. The exhibits have not only increased in number, but have grown greatly in size.

NATIONAL CONTESTS.

The contest for milk and cream producers annually held in connection with the National Dairy Show has grown remarkably since the first exhibit in 1906. Such a national contest brings together a set of unusually fine samples, from all parts of the country. From the data on the production of these samples much useful and interesting information can be obtained. The two most recent contests in connection with the National Dairy Show, in the years 1913 and 1914, brought out 217 entries, from 20 States and from Canada. The following-named States were represented, the figure after each State indicating the number of samples submitted: Wisconsin, 6; Ohio, 10; Illinois, 9; Michigan, 56; Pennsylvania, 38; Massachusetts, 12; New Hampshire, 3; Virginia, 1; New York, 10; Indiana, 2; Missouri, 1; Kentucky, 3; Washington, 37; Iowa, 1; New Jersey, 13; Texas, 1; West Virginia, 2; Connecticut, 3; Maryland, 6; Minnesota, 1. Two entries were from Canada. Thus samples were sent from as far west as the Pacific States, from as far east as the New England States, from as far south as Texas, and from as far north as Canada.

The form of entry for the National Dairy Show is presented herewith:

[National Dairy Show Association. Milk and Cream Show. Chicago, Ill., Oct. 23 to Nov. 1, 1913, under the direction of the Dairy Division, Bureau of Animal Industry, United States Department of Agriculture.]

[Only this official entry blank will be accepted.]

CLASS 209, MARKET MILK.

Gentlemen: Please enter for me 4 pints of market milk in competition for prizes offered by the National Dairy Show, in accordance with the conditions herein prescribed.

.....*Proprietor.*

.....*Manager.*

P. O. Address .....

Date ..... 1913.

(1) Competition in milk and cream department is open to all milk and cream producers in the United States and Canada.

(2) Producers of market milk may compete in both market milk and market cream classes.

(3) Producers of milk can make but one entry in any one class.

(4) Producers of certified milk are barred from competition in market milk and market cream classes. All samples of certified milk must be accompanied by a certificate issued by a medical milk commission.

(5) Entries in milk classes consist of 4 pints of milk in pint bottles.

(6) Entries in cream classes consist of four ½ pints of cream in ½-pint bottles.

(7) All entries of milk and cream after scoring become the property of the United States Department of Agriculture.

(8) No exhibitor will be entitled to a medal or diploma who does not make answer to each question, sign declaration, and forward this official entry blank to Ernest Kelly, superintendent of milk and cream exhibits, National Dairy Show, 817 Exchange Avenue, Chicago, Ill.

HOW TO COMPETE.

Milk entered to compete for prizes must be sent by express or otherwise from station nearest the producer direct to Ernest Kelly, superintendent milk and cream exhibit, care of Armour & Co., Chicago, butter and egg storage department.

EXPRESS CHARGES ON EXHIBITS MUST BE PAID TO DESTINATION.

Bottles must be carefully packed, caps should be sealed, making bottle air-tight, and both top of bottle and cap should be protected with paper, metal, or other material and all covered with crushed ice sufficient to maintain a low temperature during transportation.

The package should be plainly addressed on outside. A card should also be tacked on box, on inside, giving plainly sender's name and address so as to avoid mistakes in identifying packages.

In order that all milk entered by exhibitors may be of the same age when scored, it is hereby specified that it shall be produced on Thursday, October 16, and shipped and delivered to express company at once. This is necessary for perfectly fair competition.

A representative of the Department of Agriculture will be in Chicago to take charge of the milk on its arrival and see that it is properly cared for.

Whenever possible, entries should be shipped in cases which need not be returned. The show association does not guarantee the return of shipping cases, but will endeavor to have them returned to the proper owner at the owner's expense when properly requested.

QUESTIONS TO BE ANSWERED IN DETAIL BY EXHIBITORS OF MILK.

1. On what day and hour was the sample of milk entered in this show drawn?.....
2. How many cows contributed to the sample of milk entered?.....
3. How many cows in your herd are now giving milk?.....
4. How long since the cows contributing to the sample of milk freshened? (Average time).....
5. Are the cows supplying this sample grades or pure bred?.....
   If pure bred, give name of breed.....
6. What kind and amount of feed was given cows daily during the week preceding the production of this sample of milk?.....
7. Were cows cleaned previous to milking?..... If so, describe method of cleaning.....

8. Were cows in stable or out of doors when the sample of milk was drawn?.....
   If in stable, how was stable cared for?.....
9. What precautions were taken by the milkers as regards cleanliness of clothing and hands?.....
10. How many milkers were engaged in milking the sample entered?.....
11. What kind of milk pail was used—narrow or wide top?.....
12. How were pails cleaned previous to use?.....
13. Was milk drawn from the cow direct into the pail or through cloth cover or cotton fiber?.....
14. What method of straining milk, if any, was followed?.....
15. How long after milk was drawn from cows before it was cooled?.....
16. Describe milk cooler, if any was used.....
17. How was milk cooler prepared for use?.....
18. To what temperature was milk cooled?.....
19. How were bottles and caps prepared for use?.....
20. What bottling process or what method of bottling was followed?.....
21. How was milk cared for after bottling and previous to shipment?.....
22. Give date or hour when milk was (or will be) shipped.....
23. Do you wish shipping case returned at your expense?.....
24. Have you previously exhibited milk or cream at any local, State, or National show?.....
25. Give name and address of medical milk commission certifying to your product?

.....

Remarks: .....

.....

I, ..., do hereby declare each and every statement in answer to the above questions to be absolutely true. I do furthermore declare that the milk submitted by me in this contest is the pure natural product, free from preservatives, and that it has not been heated or changed in any way.

..... *Proprietor.*

..... *Manager.*

HOW CONTESTS ARE CONDUCTED.

In preparing for a milk and cream exhibit the persons who have charge of the contest usually send out preliminary notices to the dairymen, stating that a contest will be held at a certain time and place and urging them to prepare to enter samples. Samples should be produced about six days before the meeting; this gives ample time for announcing results and awarding prizes, and affords an opportunity for contestants to discuss their scores with the judges. Later, entry blanks, such as shown above, are sent out. The filling out and returning of these blanks is made a prerequisite to the entering of samples of milk or cream in the contest. Usually there are several classes for which prizes are offered, such as certified milk, market milk, market cream, and pasteurized milk.

Certified milk and cream must be produced under the direction of a medical milk commission and bear the proper stamp of certification. Market milk and cream classes consist of those samples which are not eligible to compete as certified. All samples in the market and certified classes must be free from preservatives. Producers of

certified milk or cream are usually prohibited from entering any samples in the market classes.

MANAGEMENT OF THE SAMPLES.

There are no restrictions placed on the dairymen as to the production of the samples for the contest. The answers to questions on the entry blank show that many methods of milking are pursued. On some farms the cows are milked in the barn; at other places they are milked in the pasture or feed lot. Various methods of cleaning the cows are resorted to, and the milk is handled in a varied number of ways after it is drawn from the cow.

All the samples of milk that are entered in a contest must be produced on the same day. This makes all the samples the same age when they are scored. After the milk is bottled, it is packed in a shipping case and surrounded with ice so that it will be in the best possible condition when it arrives at the place of exhibition. Mixing salt with the ice may cause the samples to freeze.

The samples should be consigned to some cold-storage warehouse in the city where the exhibit is to be held, and upon their arrival put immediately into a cold room. In each entry should be four bottles, one for chemical analysis, one for bacteriological examination, one for judging flavor, odor, sediment, and appearance, and one to be placed on exhibition. When all these samples have arrived, the four bottles in each entry should be given a number, preferably on a tag put around the neck of each bottle. The bottles, bearing simply the number, are submitted to the judges, and the scores are all made by numbers instead of by the names of the dairies or of the owners.

It will be noticed on page 15 that some contests are tabulated separately. These contests were held under somewhat different regulations. Instead of allowing the dairyman to submit a sample of milk produced in any way, the samples, at irregular intervals through one entire month or more, were taken from the regular supply, as it was delivered. It was believed by those in charge of these contests that such a procedure would give a more definite idea of the average milk furnished by the dairymen and would also have the advantage of continuing a supply of high-grade milk from all the dairies entered.

Two objections to this method have been raised by some authorities. First, the taking of samples, through an extended period and at times unknown to the dairyman, is the legitimate duty of any health department; therefore a contest conducted in this way is very liable to confuse the dairymen as to the distinction between health-department work and milk exhibits. The second objection is the more potent one. Under the usual procedure the dairyman knows

just when and how the milk submitted to a contest is produced. At the time of milking he has to answer questions as to all the details of the process, so that he has a record of the condition of the cows, the feed, the cleanliness of his utensils, etc. Then, when he receives his score card and observes, for instance, that he has received a cut on flavor, he can go over the various details of the production of that milk and perhaps find the method which caused the trouble. When the samples are taken at times unknown to the dairyman, the direct educational value is lost to a certain degree. The dairymen, unless they have kept a complete diary of all methods and operations during the entire month, do not know until sometime afterwards when the samples were taken and have no means of knowing the conditions that prevailed when the milk was drawn.

On the other hand it has been argued by some that the score on a sample of milk submitted by a dairyman is not a correct indicator of the average product handled by that man. For instance, a man may ordinarily have a very mediocre supply of milk but by special efforts he may produce a very high-scoring sample for competition. No claims, however, should be made at the milk exhibits by those in charge that a high-scoring sample indicates that the exhibitor has an average supply of the same high quality. It is thought, moreover, that a man who learns the principles of clean milk production well enough to produce one sample of high-scoring milk is much more likely to put those principles into general practice than a man who has not studied the principles at all. Excellent results, however, have been obtained in the collected-sample contests.

SOME EXAMPLES OF PACKING.

Much ingenuity has been shown in shipping milk to some of the shows. One firm in Canada made a large box about 4 feet square, the sides, top, and bottom of which were made of thick cork. The whole was then covered with a preparation of tar to make it waterproof, and the bottles of milk were placed in a rack inside and the box filled with ice. The whole was then crated to prevent injury to the cork-board box. The cork was intended to serve as an insulation and to keep the ice from melting so rapidly.

In 1911 one Colorado dairy sent to the National Dairy Show milk which was shipped in a specially constructed crate made as follows: A galvanized cylinder, fastened at the bottom in a galvanized-iron box, was made for each bottle of milk or cream. The bottles of milk or cream were set down in the cylinders and a tightly fitting cover placed over the top of each one. Then the space surrounding each cylinder inside the galvanized-iron box was filled with crushed ice.

So much interest in proper refrigeration of the samples has been manifested that exhibitions as far away as Seattle, Wash., have sent a man with the exhibit to re-ice it whenever necessary upon the journey.

METHOD OF SCORING THE EXHIBITS.

The samples are scored for bacteria, flavor and odor, visible dirt, fat, solids not fat, acidity, and the appearance of the bottle and cap. Cream is scored on the same basis as milk, except that no score is given for solids not fat, the total of 20 points under chemical composition being given solely to fat.

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY,
DAIRY DIVISION.

SCORE CARD FOR MILK.

Place.....

Class..... Exhibit No.....

Item.	Perfect score.	Score allowed.	Remarks.
Bacteria	35		Bacteria found per cubic centimeter
Flavor and odor	25		Cowy, bitter, feed, flat, strong
Visible dirt	10		
Fat	10		Per cent found
Solids not fat	10		Per cent found
Acidity	5		Per cent found
Bottle and cap	5		Cap Bottle
Total	100		

Exhibitor.....

Address.....

(Signed).....
Judge.

Date....., 191

D. D. No. 452. [OVER.]

DIRECTIONS FOR SCORING.

Bacteria per Cubic Centimeter—Perfect Score, 35.

	Points.		Points.
Under 500	35.0	25,001–30,000	29.0
500–1,000	34.9	30,001–35,000	28.0
1,001–1,500	34.8	35,001–30,000	27.0
1,501–2,000	34.7	40,001–45,000	26.0
2,001–2,500	34.6	45,001–50,000	25.0
2,501–3,000	34.5	50,001–55,000	24.0
3,001–3,500	34.4	55,001–60,000	23.0
3,501–4,000	34.3	60,001–65,000	22.0
4,001–5,000	34.0	65,001–70,000	21.0
5,001–6,000	33.8	70,001–75,000	20.0
6,001–7,000	33.6	75,001–80,000	19.0
7,001–8,000	33.4	80,001–85,000	18.0
8,001–9,000	33.2	85,001–90,000	17.0
9,001–10,000	33.0	90,001–95,000	16.0
10,001–11,000	32.8	95,001–100,000	15.0
11,001–12,000	32.6	100,001–120,000	12.5
12,001–13,000	32.4	102,001–140,000	10.0
13,001–14,000	32.2	140,001–160,000	7.5
14,001–15,000	32.0	160,001–180,000	5.0
15,001–20,000	31.0	180,001–200,000	2.5
20,001–25,000	30.0	Above 200,000	0.0

Note.—When the number of bacteria per cubic centimeter exceeds the local limit the score shall be 0.

Flavor and Odor—Perfect Score, 25.

Deductions for disagreeable or foreign odor or flavor should be made according to conditions found. When possible to recognize the cause of the difficulty it should be described under Remarks.

Visible Dirt—Perfect Score, 10.

Examination for visible dirt should be made only after the milk has stood for some time undisturbed in any way. Raise the bottle carefully in its natural, upright position, without tipping, until higher than the head. Observe the bottom of the milk with the naked eye or by the aid of a reading glass. The presence of the slightest movable speck makes a perfect score impossible. Further deductions should be made according to the amount of dirt found. When possible the nature of the dirt should be described under Remarks.

Fat in Milk—Perfect Score, 10.

	Points.		Points.
4.0 per cent and over	10	3.2 per cent	6
3.9 per cent	9.8	3.1 per cent	5
3.8 per cent	9.6	3.0 per cent	4
3.7 per cent	9.4	2.9 per cent	3
3.6 per cent	9.2	2.8 per cent	2
3.5 per cent	9	2.7 per cent	1
3.4 per cent	8	Less than 2.7 per cent	0
3.3 per cent	7		

Note.—When the per cent of fat is less than the local legal limit the score should be 0.

Solids Not Fat—Perfect Score, 10.

	Points.		Points.
8.7 per cent and over	10	8.1 per cent	4
8.6 per cent	9	8.0 per cent	3
8.5 per cent	8	7.9 per cent	2
8.4 per cent	7	7.8 per cent	1
8.3 per cent	6	Less than 7.8 per cent	0
8.2 per cent	5		

Note.—When the per cent of solids not fat is less than the local legal limit the score shall be 0.

Acidity—Perfect Score, 5.

	Points.		Points.
0.2 per cent and less	5	0.23 per cent	2
0.21 per cent	4	0.24 per cent	1
0.22 per cent	3	Over 0.24 per cent	0

BOTTLE AND CAP—PERFECT SCORE, 5.

Bottles should be made of clear glass and free from attached metal parts. Caps should be sealed in their place with hot paraffin, or both cap and top of bottle covered with parchment paper or other protection against water and dirt. Deduct for tinted glass, attached metal parts, unprotected or leaky caps, partially filled bottles, or other conditions permitting contamination of milk or detracting from the appearance of the package.

NOTE.—The card shown above was adopted in April, 1915, and is more nearly uniform in regard to its bacterial ratings than the old one. This one was not used in any of the contests mentioned in this bulletin, and is the third form adopted by the Dairy Division.

BACTERIA.

The samples are all plated for bacteriological examination on the same day. Standard methods of plating on agar are used, and the samples are incubated for 48 hours. In milk-contest work the dilutions used are 1 to 100 and 1 to 1,000 which give results close enough for such work. Any sample having fewer than 500 bacteria per cubic centimeter receives a perfect score, while any sample having more than 200,000 bacteria per cubic centimeter receives a zero. No attempt is made to differentiate between the kinds of bacteria present, only a quantitative analysis being made. It is a well-established principle that in the production of market milk all kinds of bacteria are to be excluded, so the awards are made on the basis of freedom from bacteria of any kind.

As bacteria in milk are extremely undesirable, both from a health as well as from economic standpoint, the greatest weight on the score card is given to freedom from bacterial contamination, 35 out of 100 points being allowed for this item.

FLAVOR AND ODOR.

While not so important as bacteria in their relation to public health, the flavor and the odor of dairy products considerably influence their commercial value. If consumers are served with an unpleasantly flavored milk, they will either use less of it or will seek some other dealer whose products are more acceptable. The most common "off flavors" and odors found in contest milk and cream are those produced by certain feeds and by the absorption of foul odors from the stable air. These defects will be considered more fully later in this bulletin.

In scoring, it is best to allow the samples to stand for a short while in a warm room, as undesirable flavors and odors are more easily detected if the milk is slightly warm. So far as possible, the room where the scoring is done should be free from any odors. The milk should be mixed as much as possible before the cap is removed. When the cap is removed about half the contents of the bottle should be poured into a clean receptacle; by quickly placing the nose over the mouth of the bottle any odor present can be detected.

Flavors, are, of course, scored by tasting the sample; if the flavor is very bad it can usually be definitely classified, but often the flavor is so slight or indistinct that it can not be traced with certainty. Even though this be the case, an experienced judge of milk is able to score the flavor of the product very accurately. Flavor and odor are allowed 25 points out of 100.

VISIBLE DIRT.

An appreciable amount of sediment in the bottom of a bottle of milk is a mute indication of carelessness between the cow and the consumer. Freedom from visible dirt does not necessarily mean that the milk is clean, but the presence of sediment does mean that not only was dirt allowed to fall into the milk, but that not even care enough was taken to strain it out.

To score perfect on this point, the judge must be unable to find so much as a single movable speck in the milk as determined by examining the bottom of the bottle. Very few samples have been scored perfect on this point, while some, on account of an extremely heavy precipitate of manure, dust, sand, cow hairs, or chaff, have been marked as low as zero.

Before scoring, the bottles should be allowed to stand undisturbed for some time to allow any sediment to settle. Then the bottle should be carefully raised without tipping and the bottom examined. An electric bulb with a long cord is a great aid in this work, as the light can be held close to the bottle. A maximum of 10 points out of 100 is allowed for freedom from visible dirt.

FAT AND SOLIDS NOT FAT.

The solids in milk are apportioned 20 points out of 100, 10 for fat and 10 for solids not fat; 4 per cent of fat and 8.7 per cent of solids not fat are minimums for which a perfect score is given. In the case of cream all 20 points are given to the fat content, 20 per cent or more being considered a perfect score. If the sample of milk or cream contains less than the legal standard, a zero is given on the score card.

The fat is determined by the Babcock method, while the solids not fat are calculated by the formula $\frac{L+F}{4}$. In this formula L stands for the corrected Quevenne lactometer reading and F represents the fat. As an illustration of this formula, let us suppose that the fat test is 4 per cent and the corrected lactometer reading is 32. Then, $\frac{32+4}{4}=\frac{36}{4}=9$. Hence, the solids not fat equal 9 per cent.

ACIDITY.

The acidity is allowed 5 points out of 100. Phenolphthalein is used as an indicator, and the milk is titrated with tenth-normal sodium hydroxid. The results are reduced to percentages and the scores allowed according to the scale on the score card. As 0.2 per cent is considered the danger line in commercial milk and cream, no sample containing more than that amount of acidity is given a perfect score. While such milk may taste perfectly sweet, it has been found that it is usually unsafe to use it on account of the fact that it is apt to turn sour very quickly.

BOTTLE AND CAP.

The general appearance of the sample is considered of importance enough to demand an allowance of the remaining 5 points out of the 100. Samples should all be submitted in regulation milk bottles, and the mouth of the bottle should be thoroughly protected from dust, dirty water, etc. Deductions should be made for dirty or chipped bottles, or for flaws or other imperfections in the glass; for metal parts, especially such as come in direct contact with the milk, slight cuts should be made in the score. Caps should be sealed in place with hot paraffin, or both cap and top of bottle covered with parchment paper or other protection from water and dirt. It very often happens that the caps are hastily placed in the bottles, or are not of the proper size. This should be penalized, as it results in leakage from the bottles as well as permitting dirty ice water, etc., to seep into them.

Bottles should be filled so that there will be no room for churning during transit. Deductions should be made for violations of this rule.

EDUCATIONAL FEATURES.

Whenever milk and cream contests are held, it is desirable to have in connection therewith a meeting or a series of meetings at which the subject of clean milk production is thoroughly discussed. Usually at least two meetings are held, one for the producers and the other for consumers. At the producers' meeting the technical side of clean milk production is taken up and the dairymen are shown how they can improve the quality of their product. Comments are made on the samples entered in the competition, and remedies for the defects are suggested. At the consumers' meeting great stress is laid on the fact that clean milk is more difficult and expensive to produce than dirty milk, and an effort is made to educate the consumer to the point where he will be willing to pay an increased price for a safer and more wholesome article of food. Instruction is given to city milk consum-

ers as to the proper care of milk in the home after it is delivered to them by the producer. These lectures are very often illustrated with stereopticon slides; also moving pictures illustrative of good and bad methods on the dairy farms are sometimes shown.

LIST OF EXHIBITIONS.

The statements following show the most important facts relating to all the competitive exhibitions so far held in cooperation with the Dairy Division.

List of milk and cream contests held in cooperation with the Dairy Division, using the first score card.

Name and place.	Date.	Product.	Number of entries.	Average score.
National Dairy Show, Chicago, Ill	Feb. 15, 1906.	Market milk	23	89.70
		Market cream	14	93.60
		Certified milk	8	94.80
Granite State Dairymen's Association, Peterboro, N. H.	Dec. 6–7, 1906.	Market milk	11	90.80
		Market cream	9	91.40
City milk contest, Cleveland, Ohio	Mar. 16, 1907.	Market milk	53	90.30
		Market cream	6	88.50
Granite State Dairymen's Association, Whitefield, N. H.	Dec. 5–6, 1907.	Market milk	4	83.20
		Market cream	6	89.40
State Dairymen's Association, Marengo, Ill	Jan. 13–15, 1908.	Market milk	6	93.20
		Market cream	2	93.50
Pennsylvania State Dairy Union, Wilkes-Barre, Pa.	Jan. 14–16, 1908.	Market milk	10	91.90
		Certified milk	4	95.80
State Dairymen's Association, Columbus, Ohio	Feb. 12–14, 1908.	Market milk	10	89.90
		Market cream	12	90.00
State Dairymen's Association, Battle Creek, Mich.	Feb. 19–21, 1908.	Market milk	5	95.50
		Market cream	4	94.40
City milk contest, Cleveland, Ohio	Mar. 7, 1908.	Market milk	38	88.50
		Market cream	6	90.50
State Dairymen's Association, Traverse City, Mich.	Mar. 11, 1908.	Market milk	10	91.10
City milk contest, Pittsburgh, Pa	Oct. 22, 1908.	Market milk	50	85.20
		Market cream	8	77.70
National Dairy Show, Chicago, Ill	Dec. 2–10, 1908.	Market milk	30	85.70
		Market cream	20	83.80
		Certified milk	14	90.20
		Certified cream	6	85.90
State Dairymen's Association, Dexter, Me	Dec. 8–10, 1908.	Market milk	39	91.60
		Market cream	31	88.60
State Dairymen's Association, Burlington, Vt	Jan. 6, 1909	Market milk	29	90.60
		Market cream	16	81.30
Granite State Dairymen's Association, Contoocook, N. H.	Jan. 13–14, 1909.	Market milk	5	92.50
		Market cream	7	90.40
City milk contest, Columbus, Ohio	Feb. 5, 1909	Market milk	15	91.80
		Market cream	7	92.30
State Dairymen's Association, Grand Rapids, Mich.	Feb. 17–19, 1909.	Market milk	6	81.10
		Market cream	4	95.20
City milk contest, Toledo, Ohio	Feb. 27, 1909	Market milk	7	90.80
		Market cream	5	86.00
Kentucky Dairy Cattle Club, Lexington, Ky	Mar. 13, 1909	Market milk	4	94.20
Michigan Dairymen's and Grand Traverse Dairymen's Associations, Traverse City, Mich.	Mar. 25, 1909.	Market milk	6	93.50
City milk show, Cincinnati, Ohio	May 7, 1909	Market milk	47	83.80
		Certified milk	25	87.71
City milk show, Grand Rapids, Mich	May 14, 1909	Market milk	39	90.63
		Market cream	14	89.59
City milk show, Dayton, Ohio	Sept. —, 1909.	Market milk	11	90.71
		Market cream	1	91.00
Illinois State Fair, Springfield, Ill	Oct. 1–9, 1909.	Market milk	7	74.70
		Market cream	7	78.80
		Certified milk	2	72.00
National Dairy Show, Milwaukee, Wis	do	Market milk	21	85.05
		Market cream	13	85.12
		Certified milk	12	79.10
		Certified cream	6	81.75
City milk show, Pittsburgh, Pa	Nov. 4, 1909	Market milk	44	89.24
		Market cream	4	92.10
Maine Dairymen's Association, Skowhegan, Me	Dec. 1, 1909	Market milk	51	89.70
		Market cream	31	86.00
Michigan Dairymen's Association, Detroit, Mich	Feb. 4, 1910	Market milk	8	95.81

Summary to February 4, 1910.

Number of contests			28
Samples entered	893	Milk 654	Certified 65
			Market 589
		Cream 239	Certified 12
			Market 227
Average scores		Certified milk	87.54
		Certified cream	83.83
		Market milk	88.77
		Market cream	87.47

It should be stated that up to this date certified milk and market milk were judged by different standards; hence it is owing to this fact and not to inferiority that the former has a lower average score than the market milk. During 1910 new score cards for milk and cream were devised, which gave greater weight to the bacterial count and less to flavor and chemical composition. The results of the competitions during the use of the second form of score card are as follows:

List of milk and cream contests held in cooperation with the Dairy Division during the use of second score card.

Name and place.	Date.	Product.	Number of entries.	Average score.
Illinois State Fair, Springfield, Ill.	Oct. 4, 1910.	Certified milk	1	90.30
		Certified cream	1	95.00
		Market milk	13	68.77
		Market cream	6	67.22
National Dairy Show, Chicago, Ill.	Oct. 19–29, 1910.	Certified milk	30	86.75
		Certified cream	8	85.45
		Market milk	51	85.13
		Market cream	16	79.11
State Dairymen's Association, Baltimore, Md.	Nov., 1910.	Market milk	37	75.91
Kentucky Dairy Cattle Club, Lexington, Ky.	Jan. 3–5, 1911.	Certified milk	3	91.50
		Certified cream	3	87.33
		Market milk	7	75.93
		Market cream	3	69.33
State Dairymen's Association, Roanoke, Va.	Jan. 11, 1911.	Market milk	13	89.98
		Market cream	3	83.66
State Dairy Union, Harrisburg, Pa.	Jan. 23–27, 1911.	Certified milk	1	86.75
		Market milk	8	87.55
		Market cream	2	75.13
Philadelphia Milk Show, Philadelphia, Pa.	May 20–27, 1911.	Certified milk	16	86.18
		Certified cream	2	89.25
		Market milk	16	85.13
		Market cream	4	74.56
City milk show, Detroit, Mich.	Sept. 25–26, 1911.	Market milk	111	75.40
		Market cream	4	79.56
State fair, Springfield, Ill.	Sept. 29–Oct. 7, 1911.	Certified milk	1	83.90
		Certified cream	1	86.25
		Market milk	16	77.46
		Market cream	14	80.26
National Dairy Show, Chicago, Ill.	Oct. 26–Nov. 4, 1911.	Certified milk	17	88.46
		Certified cream	4	91.28
		Market milk	28	84.68
		Market cream	18	80.09
Muskegon Milk Show, Muskegon, Mich.	Dec. 6–9, 1911.	Market cream	1	92.25
		Market milk	17	85.63
State dairy union, Pittsburgh, Pa.	Jan. 15–20, 1912.	Certified milk	1	93.25
		Market milk	42	85.33
		Market cream	3	88.75
Farmers' week show, Amherst, Mass.	Mar., 1912.	Certified milk	1	95.00
		Market milk	40	92.06
		Market cream	14	87.21
City show, South Bend, Ind.	June 12, 1912.	Market milk	3	94.63

List of milk and cream contests held in cooperation with the Dairy Division during the use of second score card—Continued.

Name and place.	Date.	Product.	Number of entries.	Average score.
National Dairy Show, Chicago, Ill.	Oct. 24–Nov. 2, 1912.	Certified milk	15	91.18
		Certified cream	2	89.65
		Market milk	39	85.14
		Market cream	18	79.75
City milk show, Detroit, Mich.	Nov. 11–12, 1912.	Market milk	163	81.57
		Market cream	7	91.62
Pacific International Dairy Show, Portland, Oreg.	Nov. 21, 1912.	Certified milk	7	91.95
		Market milk	5	91.73
		Market cream	1	95.40
City milk show, Jacksonville, Fla.	Dec. 14–21, 1912.	Market milk	21	91.39
State Dairy Union, Harrisburg, Pa.	Jan. 22, 1913.	Certified milk	3	93.79
		Market milk	30	88.43
		Market cream	4	89.86
State Dairymen's Association, Saginaw, Mich.	Feb. 4–7, 1913.	Market milk	23	85.53
		Market cream	7	82.40
State Dairymen's Association, Richmond, Va.	Feb. 6, 1913.	Market milk	16	80.09
		Market cream	4	88.19
Bureau of Social Service, Muskegon, Mich.	Feb. 7–10, 1913	Market milk	17	92.07
		Market cream	1	92.65
Farmers' week show, Amherst, Mass.	Mar. 19, 1913.	Certified milk	2	92.60
		Market milk	63	88.93
		Market cream	16	88.42
Industrial Exposition, Rochester, N. Y.	Sept. 16, 1913.	Market milk	15	85.67
State Fair, North Yakima, Wash.	Oct. 1, 1913.	Certified milk	2	95.13
		Market milk	27	75.11
		Pasteurized milk	6	57.11
City milk show, Tacoma, Wash.	Oct., 1913.	Market milk	28	63.13
		Pasteurized milk	2	63.22
National Dairy Show, Chicago, Ill.	Oct. 23–Nov. 1, 1913.	Certified milk	23	90.58
		Market milk	73	92.22
		Market cream	19	88.68
State milk show, Springfield, Mass.	Dec. 2–3, 1913.	Market milk	145	88.06
		Market cream	24	80.94
State Dairy Union, York, Pa.	Jan. 13, 1914.	Certified milk	4	90.20
		Market milk	19	88.28
City milk show, Salt Lake City, Utah.	Jan. 22, 1914.	Market milk	39	67.72
		Pasteurized milk	6	56.21
State Dairymen's Association, Grand Rapids, Mich.	Feb. 10–13, 1914.	Market milk	39	87.58
		Market cream	9	79.37
Farmers' week, Amherst, Mass.	Mar. 18, 1914.	Market milk	95	89.29
		Market cream	23	87.09
City show, Tacoma, Wash.	Apr. 21, 1914.	Market milk	42	72.36
American Association of Medical Milk Commissions, Rochester, N. Y.	June 10, 1914.	Certified milk	17	86.63
		Market milk	17	86.95
Charter Oak Fair, Hartford, Conn.	Aug. 27, 1914.	Market milk	18	85.50
		Market cream	10	76.45
State Fair, Detroit, Mich.	Sept. 7–18, 1914.	Certified milk	2	80.32
		Market milk	111	81.49
		Market cream	4	81.85
National Dairy Show, Chicago, Ill.	Oct. 24, 1914.	Certified milk	19	91.31
		Market milk	64	89.61
		Market cream	18	88.97
Chamber of Commerce, Cumberland, Md.	Nov. 9, 1914.	Market milk	17	84.89
State show, Worcester, Mass.	Dec. 2, 1914.	Market milk	133	89.37
		Market cream	24	87.91
State Dairymen's Association, Manchester, N. H.	Feb. 10, 1915.	Market milk	45	92.28
		Market cream	8	92.10
Pure-food department show, Tampa, Fla.	Feb. 12–16, 1915.	Market milk	23	84.77
State Dairymen's Association, Flint, Mich.	Feb. 17, 1915.	Market milk	39	89.88
		Market cream	5	90.40
City milk show, Grand Rapids, Mich.	Feb. 22, 1915.	Market milk	26	83.82
		Market cream	13	73.77
City milk show, Pontiac, Mich.	Feb. 25, 1915.	Market milk	36	89.79
		Market milk	75	88.52
Farmers' week show, Amherst, Mass.	Mar. 19, 1915.	Market cream	20	91.72
		Pasteurized milk	6	87.25

Summary of scores made with the second card.

Number of contests				45
Number of samples	2,434	Milk	2,090	Certified 165
				Market 1,905
				Pasteurized 20
		Cream	344	Certified 21
				Market 323

The following-named contests, on account of the different methods of collecting samples, are not included in the averages:

Name and place.	Date.	Product.	Number of entries.	Averages.
State Dairymen's Association, Baltimore, Md	Dec. 7–8, 1911	Market milk	33	67.07
	Nov. 20, 1912	Market milk	17	81.18
	Nov. 15, 1913	Market milk	47	71.05
Granite State Dairymen's Association, Concord, N. H.	Feb. 11–12, 1914	Market milk	26	[1]
		Market cream	4	[1]
City show, Portland, Oreg	Mar. 20, 1914	Certified milk	2	93.33
		Market milk	106	76.19
		Pasteurized milk	17	69.44
City show, Seattle, Wash	May 18, 1914	Certified milk	5	95.37
		Market milk	76	82.63
		Pasteurized milk	17	66.21
City show, Portland, Oreg	June 8, 1914	Certified milk	2	93.12
		Market milk	105	85.88
		Pasteurized milk	10	84.19
City show, Seattle, Wash	Sept. 9, 1914	Certified milk	5	94.21
		Market milk	73	76.56
		Pasteurized milk	15	67.28
Illinois State Fair, Springfield, Ill	Sept. 18, 1914	Market milk	35	[1]
State Dairymen's Association, Baltimore, Md	Nov. 13, 1914	Market milk	25	82.01
City show, Portland, Oreg	Dec. 11, 1914	Certified milk	2	94.70
		Market milk	111	87.66
		Pasteurized milk	15	88.36
City show, Seattle, Wash	Jan. 8, 1915	Certified milk	5	95.34
		Market milk	80	83.06
		Pasteurized milk	19	72.18
City show, Portland, Oreg	Mar. 31, 1915	Certified milk	2	95.12
		Market milk	101	90.42
		Pasteurized milk	15	88.60
Portland Pure Milk Co., Portland, Oreg	Jan. 29, 1915	Market milk	63	91.59

[1] No data.

One hundred and twenty-nine other samples have been judged under regulations somewhat different from those described.

AVERAGE SCORES OF RECENT CONTESTS.

The average scores of the contests in which the second score cards were used are as follows:

Average scores, in detail, of contests where the second cards were used.

Item.	Milk.			Cream.		
	Perfect score.	Certified.	Market.	Perfect score.	Certified.	Market.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Bacteria	35	31.04	30.51	35	28.83	26.00
Flavor and odor	25	20.29	22.95	25	20.43	20.08
Visible dirt	10	8.85	8.67	10	9.28	9.18
Fat	10	9.33	9.19	20	19.52	19.91
Solids not fat	10	9.53	9.09			
Acidity	5	4.94	4.89	5	4.76	4.85
Bottle and cap	5	4.94	4.62	5	4.77	4.73
Total	100	88.92	89.92	100	87.59	84.75

To demonstrate further the weakest points in the samples entered in these contests, the table below shows the scores on each class of milk and cream in terms which indicate the per cent of the average score to the perfect score.

Per cent of perfection attained by samples in preceding table.

Item.	Milk.		Cream.	
	Certified.	Market.	Certified.	Market.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Bacteria	88.68	87.17	a2.37	74.28
Flavor and odor	81.16	91.80	81.72	80.32
Visible dirt	88.50	86.70	92.80	91.80
Fat	93.30	91.90	97.60	99.55
Solids not fat	95.30	91.90	.....	.....
Acidity	98.80	97.80	95.20	97.00
Bottle and cap	98.80	92.40	95.40	94.60

These two tables bring out some very interesting data concerning the samples of milk and cream entered.

It is believed that the second form of the milk and cream score card which was in use gave a great deal better analysis of the quality of the milk than the old one. The first milk and cream score cards put certified milk and cream at a disadvantage, as different cards were used for the certified and market classes, the standards for certified milk being much higher. This must be remembered in examining the average scores made in the contests held while the first cards were in use. Also a higher standard was made for acidity in certified milk than in market milk.

It was decided after much deliberation that only one score card should be used for milk, whether it be certified or market. The great point to be made in the consideration of milk is its value as a food for infants, so in the final analysis all milk must be considered from the same standpoint when held up to the standard of perfection.

The second card balanced up the desirable characteristics in a much better way than the old, and the results seem to justify the change. Certified milk averaged better than market milk on every point except on flavor and odor, where it fell about $2\frac{1}{2}$ points behind market milk.

The average score of the certified milk for bacteria, 31.04 per cent, indicates that the average sample submitted contained from 6,000 to 7,000 bacteria per cubic centimeter. The average fat content was between 3.6 and 3.7 per cent. The average solids not fat were almost 8.7 per cent, while the average acidity ran between 0.2 and 0.21 per cent. In the market milk the average score indicates a bacterial count of between 7,000 and 8,000; the fats average between 3.5 and 3.6 per cent; the solids not fat between 8.6 and 8.7 per cent; while the acidity was between 0.2 and 0.21 per cent.

Considering that some of the samples above were shipped 2,000 miles or more, were several days in transit, and after their arrival they were held in storage for several days, making them over a week

old when scored, the showing is remarkable and points out very strongly the fact that milk properly produced and handled and thoroughly refrigerated in transit and storage can be kept sweet for a considerable length of time.

The latest card shown on page 7 is more nearly uniform as to cuts in bacterial rating than the former cards. For the same increase in bacteria practically the same cuts are made, there being no serious breaks.

BENEFITS OF MILK CONTESTS TO DAIRYMEN.

As milk and cream contests are intended primarily for the education of the dairymen, it is interesting to go over the scores made in some of these contests to see whether they accomplish the purpose. In examining the scores of contests which have been held in the same place two years in succession, two things are very noticeable. The first is that dairymen who compete for two successive years almost always do better in a second contest than they did in their first, showing very plainly that they have received valuable suggestions as to the production of sanitary milk. The second is that dairymen who have had experience in these competitions nearly always do better than those who are competing for the first time. The following results which have been tabulated from three contests show conclusive figures along these lines:

MARYLAND STATE DAIRYMEN'S ASSOCIATION, 1911 CONTEST.

	Average score.
10 men who competed the year previous	73.83
23 men competing for the first time	64.15

ILLINOIS STATE FAIR.

	Average score 1910.	Average score 1911.
7 dairies which competed both years	74.64	79.68
7 dairies which did not compete in 1910		64.39

NATIONAL DAIRY SHOW.

Market milk:		
5 dairies which competed both years	89.50	89.53
23 dairies which did not compete in 1910		83.62
Certified milk:		
14 dairies which competed both years	83.10	91.05
3 dairies which did not compete in 1910		75.72

Looking at the Maryland State Dairymen's Association's 1911 contest, it is seen that the 10 men who had had previous experience in preparing milk for contests averaged more than 9 points better on the score card than those men who were competing for the first time.

At the Illinois State Fair in 1911 those who had competed the previous year bettered their former scores by more than 5 points and

averaged more than 15 points higher than the dairymen who were competing for the first time.

The scores made by both market and certified milk samples at the National Dairy Shows in 1910 and 1911 have been compiled, and they show similar results for the two years, though in the case of market milk the improvement from 1910 to 1911 is very small; but the fact that the dairies which had had the advantage of a previous competition averaged 6 points better than the new competitors bears out the truth of the statements made in this connection. The improvement in the certified milk was very remarkable, as in 1911 14 dairies increased their 1910 score by nearly 8 points and exceeded by more than 15 points the 3 certified dairies which were competing for the first time.

These figures, which are the result of the compilation of a large number of samples, show how the dairyman is taught by these contests to improve the quality of his products. The score cards made on each exhibit of milk and cream are always sent to the competitors with comments on the defects of the product, and they should contain suggestions for improvement. Progressive dairymen everywhere are availing themselves of the benefits derived from these contests and are finding that the competition aids them in many ways.

EXTRACTS FROM LETTERS.

The following are quotations from letters that have been received from dairymen subsequent to milk contests:

I was so much surprised on the following morning after the announcement; when I arrived in town the people came in every direction to congratulate me on my success; I could not believe it. From the fact that there are so many older and more experienced dairymen than myself I was not expecting anything of the kind.

I have this much confidence in myself that if I won this time I will try again. I have discovered where I can make much improvement next time in flavor.

I expect to use narrow-top pails hereafter. I use straw for bedding; I dampen my bedding with a sprinkler just before the cows go in. I washed my cow 12 hours before milking; later, I rubbed her down one hour before milking I rubbed her down again with a damp cloth.

* * * * * * *

We are very glad that we had our goods entered. The winning of cup and honorable mention are a source of satisfaction, not from their value, but to know our standing.

We have been trying to produce good, clean, wholesome products, but did not know where we stood as compared with others, as this was our first entry.

It has certainly been a good advertisement for us, as we have not been able to fill our orders since.

* * * * * * *

Although my milk was not good enough to receive a diploma, I learned more than if it had scored better. The appearance of the samples on Friday made me think I was free of many undesirable kinds of bacteria, and I believe that if my methods are improved I can produce as good milk as is produced in the much more expensive plants.

SUGGESTIONS FOR THE PRODUCTION OF CONTEST MILK.

It has been found in examining the answers to the questions concerning the production and handling of the best samples of milk and cream entered in contests that the producers have in every case exercised great care, and that the results obtained bear out the principles which from time to time have been laid down as necessary for the production of pure milk. It is not the purpose here to go into great detail regarding all methods which might be used, but a short résumé of the more important things to be considered in preparing a sample of milk or cream to enter in one of these contests will be presented.

BACTERIA.

As the bacterial count has so much weight on the score card, it will very naturally be the source of much consideration on the part of the producer. The bacterial count in samples entered in past contests has varied from below 100 to several millions per cubic centimeter. As it can be assumed that any one preparing samples for contests will exercise all the care and intelligence which he possesses, it must be concluded that at the present time many of our producers do not understand just where the bacteria come from and how their entrance into the milk can be prevented.

First of all, in the production of milk which will have a low bacterial count, it is necessary to have absolute cleanliness in every branch of the work. The barn itself and the barn air must be free from dust at the time of milking. This can be accomplished by keeping the walls, ceiling, and floors scrupulously clean, and some producers just before milking time have even gone so far as to sprinkle the air in the barn, and also the bedding, with a fine spray of water to lay the dust. The cow herself is a source of very dangerous bacterial contamination. She very often carries on her skin dust, dry manure, loose hair, and other impurities, which fall into the milk pail during the process of milking. To produce milk of the highest grade it is necessary to have the cows thoroughly groomed with the currycomb and brush. Just before milking is commenced the cow's udder and flanks should either be wiped with a damp rag or the parts thoroughly washed and then dried with a clean towel, so that no water can drip from the body into the milk pail. Better results are obtained, however, if the cow's hair is slightly moist during milking. This method washes from the cow's hide much dust and dirt which might not be removed by currying. The hands of the milker should be thoroughly cleaned, and to secure the best results he should milk dry-handed.

It has been demonstrated that a large number of the bacteria that get into the milk may be excluded by the use of a small-top pail, which protects the milk from dust and germs which may drop from

the cow's body. All utensils, such as pails, strainers, bottles, dippers, etc., which come into contact with the milk, should be sterilized with either live steam or boiling water. Many dairymen make the mistake of thoroughly washing the bottles and then rinsing them with water which is only warm. This does not kill the bacteria which may be on the surface of the utensils, and considerable contamination ensues. Many competitors have been in the habit of discarding the first few streams of milk that come from each teat, for it is known that the first milk drawn contains a larger proportion of bacteria than that which follows. Milking should be done as quickly as possible and with as little agitation of the cow's udder as is possible, as such a disturbance is very liable to shake bacteria from the cow's hide into the milk pail.

As milk is so easily contaminated it is necessary, as soon as drawn, to take it to a clean, convenient milk house, where it can be cooled immediately. The milk house should be well protected against flies and should be scrupulously clean. As bacteria grow very fast in warm milk, prompt cooling is an absolute necessity. Fresh milk containing 100 bacteria per cubic centimeter, if not cooled will in the course of time contain the offspring of the original bacteria which may amount to millions. In the scoring of cream it has been noticed that the bacterial count has averaged higher than that of the milk samples submitted. This may be attributable to the fact that clumps of bacteria are broken up by the force of the separator, and hence an apparently larger count is the result, or it may be caused by milk passing through one more piece of apparatus, namely, the separator, which is not always thoroughly cleaned and sterilized.

The bottles into which the product is put and the caps with which they are sealed should be sterilized so that no contamination can ensue. In cooling the milk it is not necessary that any special form of cooler be used. In fact, many of the successful competitors in the past who have obtained very low bacterial counts have believed that the exposure of the milk to the air in passing over a cooler was not a desirable feature, and have bottled the milk warm and cooled it with ice water. While this method does not cool the milk quite so quickly, it saves it from any possible contamination caused by exposing it in a thin sheet to the air. Bottles should be kept in ice or ice water until ready for shipment; then they should be packed in a durable shipping case surrounded with ice and forwarded without delay.

FLAVOR AND ODOR.

Several causes contribute to undesirable flavors and odors in milk and cream. One instance is the flavor which is the result of bacterial action. This may be owing to the lactic-acid bacteria which sours

milk. In some contests those in charge have received samples that were actually curdled; such milk, being of no value as market milk, could not, of course, get credit for flavor or odor. Then certain forms of bacteria cause fermentation or decomposition in milk, and when they have worked for a considerable length of time they cause a very undesirable flavor.

Certain feeds also contribute to the flavor and odor. In several competitions milk scores have been cut heavily because of a pronounced garlic flavor. Silage flavor is very often in evidence, especially during cold spells in the winter when the barns are kept tightly closed. If the silage is fed directly after milking instead of either before or during milking, there should be no trouble on account of silage flavor in milk. There is one thing, however, that must be remembered: If the cows leave any silage in the mangers it must be cleaned out and taken from the barn when they are through, as the warm milk very readily absorbs the silage odor if it is in the air. The stable air, if close or "cowy," is another source of bad odors which are absorbed by the milk. Sometimes flavors are detected in milk which are due to foreign substances. Milk has been submitted in bottles from the rubber parts of which it had absorbed a flavor of rubber. The use of unparaffined caps may give rise to a "brown paper" flavor in the milk.

It would seem that the best results, so far as flavor and odor go, can be secured by mixing the milk of three or more cows. Sometimes the physical condition of the cow or the period of her lactation influences the flavor of the milk considerably, so that if the milk from only one cow is submitted there is a risk of the individuality of the cow playing some part in the flavor. It is also best to avoid "stripper" milk on account of a strong flavor which very often develops.

VISIBLE DIRT.

With proper care in milking or even with proper care in straining there is no excuse for large amounts of sediment in milk. As a matter of fact, however, few samples, even in the certified milk class, have been scored perfect on this point, and some samples have been so extremely dirty as to receive a zero on the score card. The sediment usually found is a fine, dark-brown or black precipitate, which is the result of dust and dried manure finding its way from the cow's hide into the milk. Some of this fine sediment in a state of temporary suspension in the milk may pass through coarse strainer cloths, if such are used, and settle to the bottom of the bottle after the milk is allowed to stand for any considerable time. Very often large pieces of foreign matter have found their way into the milk. In some cases it is almost unbelievable that such matter could get into contest

milk and escape the observation of the producer. Bits of straw or hay an inch or an inch and a half long have been found in the bottom of the bottle, and cow hairs are often found in the sediment, and occasionally bristles from brushes

To avoid visible dirt in the milk and thus receive a high score on this point it is necessary to follow the rules for cleanliness laid down under the heading "Bacteria." Sometimes the sediment is due to the fact that pails or bottles after being sterilized are allowed to stand uncovered. If there is any wind stirring, chaff, dust, etc., are almost sure to be blown into the pails or bottles and will thus appear as sediment in the milk. Coarse strainers should be avoided if the producer wishes to get all the fine dirt out of the milk. The best results in the past have probably been secured with the use of cotton as a straining medium. Various forms of cotton are on the market, some in bulk and some prepared in thin sheets especially for straining. In the answers to questions on the production of milk for contests there does not seem to be any special advantage in milking on to a strainer over the milk pail. Unless the strainer cloth is changed when each cow is milked such a practice is liable to result in worse contamination than when the milk is simply milked into an open pail and then strained into the can.

FAT AND SOLIDS NOT FAT.

Except in occasional cases a normal milk having a fat content of 4 per cent contains more than 8.7 per cent of solids not fat. In some contests several samples have been entered which apparently had been modified by the producer in the attempt to obtain a higher score on chemical composition. Milks testing 8 per cent of fat and over have been submitted. Fortunately, such an adulteration is very easily seen by the judges when the fat is compared with the solids not fat. The contestant who tries to improve upon nature in this manner often decreases, rather than increases, his score. Any milk containing as much as 4 per cent of fat receives a perfect score, so that an 8 per cent milk gets no higher score on fat than a 4 per cent milk. The result of adding cream to milk to bring it from a 4 per cent to an 8 per cent fat is to lower the proportion of solids not fat in the milk, so that the score on that item is sometimes cut considerably. In normal milk the solids not fat increase as the fat increases but not in the same ratio. In milk to which cream has been added, however, the fat increases and the solids not fat are decreased.

To eliminate contact with all unnecessary utensils some contestants have milked directly into the milk bottle. The first part of the milk drawn from the cow is quite deficient in fat, while the very last of the milk runs high in that constituent. In order to have a normal

chemical composition in milk it is necessary to mix the entire milk from one or more cows.

ACIDITY.

The presence of acid-forming bacteria in milk in large numbers is usually responsible for a high acidity. It may be that there are other factors which play an important part in the acidity of milk, but at the present time they are not well understood. To keep down the acidity of milk caused by acid-forming bacteria it is necessary to keep the bacterial count as low as possible by following the precautionary measures previously mentioned. To check the growth of bacteria the milk should be thoroughly iced from the time of milking until it is scored.

BOTTLE AND CAP.

It is best to select bottles which are made of clear glass and which are free from flaws and other imperfections. The bottles should be filled up to the cap seat with the milk or cream. The cap should fit the mouth of the bottle tight enough to prevent leakage but not so tight that it will have to be jammed in order to force it into place. When it is in place melted paraffin may be poured on it, taking care to fill the depression in which the cap rests. The bottle top may be protected by waterproof material, such as oiled or paraffined paper, tin or tin-foil caps, etc. The most common cut against the appearance of the bottle and cap has been made because either the bottles have not been filled or because the cap and the mouth of the bottle were not properly protected. The protection of the mouth of the bottle is important not only from the standpoint of appearance but because iced cases of bottles are piled one above the other and often the dirty water resulting from the mixture of dust and melted ice trickles down upon the bottles.

PUBLICATIONS OF U. S. DEPARTMENT OF AGRICULTURE RELATING TO MILK AND CREAM.

AVAILABLE FOR FREE DISTRIBUTION.

The Application of Refrigeration to the Handling of Milk. (Department Bulletin 98.)
The Alcohol Test in Relation to Milk. (Department Bulletin 202.)
Estimation of Total Solids in Milk by Use of Formulas. (Bureau of Animal Industry Bulletin 134.)
Influence of Stage of Lactation on Composition and Properties of Milk. (Bureau of Animal Industry Bulletin 155.)
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